UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/696,081	10/29/2003	Sharon Liu	GP-302997	5946

7590 09/18/2007

CHRISTOPHER DEVRIES
General Motors Corporation
Legal Staff, Mail Code 482-C23-B21
P. O. Box 300
Detroit, MI 48265-3000

EXAMINER	
SILVER, DAVID	
ART UNIT	**PAPER NUMBER**
2128	

MAIL DATE	DELIVERY MODE
09/18/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/696,081
Filing Date: October 29, 2003
Appellant(s): LIU ET AL.

Paul D. Amrozowicz
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 18th day of June, 2007 appealing from the Office action mailed 26th day of January 2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

Bewley, Thomas R. "Adjoint and Raccati: essential tools in the analysis and control of transitional and turbulent flow systems", UC San Diego GALCIT Seminar, (Oct 12 2001), slides 1-30 (totaling 15 pages)

Kolmanovsky, Ilya. "Evaluation of Turbocharger Power Assist System Using Optimal Control Techniques", Society of Automotive Engineers, Inc, article id 2000-01-0519 (2000), pp. 1-11

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 22-27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas R. Bewley's "Adjoint and Raccati: essential tools in the analysis and control of transitional and turbulent flow systems" ("Bewley"), and further in view of Ilya Kolmanovsky's "Evaluation of Turbocharger Power Assist System Using Optimal Control Techniques" ("Kolmanovsky").

Bewley discloses: 22. A method of identifying unknown model parameters of a non-linear dynamic system model, the method comprising: determining a governing state equation for the powertrain system **(Slide 10, 5, 7)**; determining a cost function **(slide 17, 2, 5, 15)**; determining a perturbation state equation from the governing state equation **(slide 5, 10, 18, 26)**; determining an adjoint equation from the governing state equation **(slide 6, 7, 18)**; determining an adjoint identity from the governing state equation **(slide 19 "adjoint identity", 6, 7, 18)**; determining a perturbation cost function based at least in part on the determined adjoint equation, the determined perturbation station equation, and the determined adjoint identity **(slide 18, 5, 10, 26)**; determining a gradient based at least in part on the determined adjoint equation **(slide 2, 6, 10, 16)**; supplying the governing state equation, the adjoint equation, and the perturbation cost function to a general purpose processor; and causing the general purpose processor to iteratively determine changes in the perturbation cost function that result from incremental changes in arbitrarily chosen values of one or more of the unknown parameters to thereby identify the unknown model parameters **(slide 10, 21, 25 "centralized computer")**.

Bewley however does not appear to substantially disclose that the non-linear dynamic system model includes one or more powertrain system models. Kolmanovsky discloses an analogous adjoint based system modeling having the said feature **(page 2 col 2 para 2; page 2 col 2 section titled "Powertrain Model")**. Bewley and Liu appear to be sponsored by GM Powertrain (Transmission Group) (Bewley2 page 347 last paragraph). As such, it would appear that Bewley and Liu would have an interest in developing a system that relates to GM's Powertrain Transmission Group. Furthermore, Bewley provides motivation on (slide 28 "Extension to 2D base flows (e.g., cylinder, ...)", slide 29).

Bewley discloses: 23. The method of Claim 22, further comprising: determining one or more initial states for solving the governing state equation **(slide 12 last line "initial conditions")**; supplying one or

more of the initial states to the general purpose processor; and causing the general purpose processor to iteratively determine changes in the cost function that result from incremental changes in one or more of the initial states **(slide 10, 25)**.

Bewley discloses: 24. The method of Claim 22, wherein: the adjoint equation includes one or more adjoint states; and the incremental changes are driven by gradients derived from the adjoint states **(this is an inherent feature of adjoint equations; middle page 10)**.

Bewley discloses: 25. The method of Claim 22, wherein the changes in the cost function are iteratively determined until a specified accuracy criterion is met **(slide 2 item 4 "convergence")**.

Bewley discloses: 26. The method of Claim 22, wherein the changes in the cost function are iteratively determined until a predetermined number of iterations is completed **(slide 2 item 4 "convergence")**.

Bewley discloses: 27. The method of Claim 22, further comprising: determining the state equation, cost function, adjoint equation, and gradient by supplying one or more exogenous inputs from powertrain system measurements or controller generated signals **(slide 25 "sensor measurements, slide 6, 7, 18)**.

Bewley discloses: 29. The method of Claim 22, further comprising: validating the non-linear dynamic model using the identified model parameters against one or more sets of experimentally determined or simulated data **(slide 10 "linearization changes at each iteration")**.

(10) Response to Argument

The 35 U.S.C. § 102(b) rejection of claim 22 as being anticipated by Kolmanovsky has been withdrawn to simplify the issues before the Board.

10.1 **Appellants argue:**

10.1.1 "Appellant submits that the Examiner has not met his burden in establishing a *prima facie* case of obviousness, because the prior art does not objectively teach or suggest all of the claim elements, and as such the Examiner unwittingly relied on impermissible hindsight reasoning.

10.1.2 In particular, the final Office action cites various slides in Bewley et al. as allegedly disclosing the claimed method, with the exception of applying the method to a powertrain model, which is why Kolmanovsky et al. was cited. Nonetheless, when the final Office action is reviewed, it is clear that the analysis included therein is faulty.

10.1.3 For example, the final Office action cites slides 18, 5, 10, and 26 of Bewley et al. as allegedly disclosing the step of determining a perturbation cost function based at least in part on the determined adjoint equation, the determined perturbation state equation, and the determined adjoint identity (final Office action at page 5). Yet, when these slides are objectively reviewed and studied, it is seen that these slides disclose: (1) the adjoint identity (slide 18); (2) a state equation, a perturbation equation, and a cost function (slide 5); (3) how a control solution can be found from a defined state equation and a perturbation equation (slide 10); and (4) implementation of Fourier-space compensators (slide 26).

10.1.4 Appellant submits that all of the slides from Bewley et al., let alone those slides identified in the final Office action, can be placed side-by-side and will never, without the aid of Appellant's own disclosure, disclose or even remotely suggest at least this step." **(Brief page 9 line 25 to page 10 line 13)**

10.1.5 Appellants continue to state that Kolmanovsky fails to remedy the alleged *prima facia* deficiency.

10.2 **Examiner Response:**

10.2.1 As per subsections 1, 2 and 3*supra*, Appellants argue impermissible hindsight for citing features disclosed in a single reference as part of a 35 U.S.C. § 103 rejection. This argument is puzzling because the Appellants are applying the argument to a single reference even thought all of the features are disclosed as claimed.

Appellants expand on their argument by stating the Bewley does not disclose "the step of determining a perturbation cost function based at least in part on the determined adjoint equation, the determined perturbation state equation, and the determined adjoint identity".

A few basic mathematical constructs are established for clarity:

1. "**inverse function:** (a function obtained by expressing the dependent variable of one function as the independent variable of another; f and g are inverse functions if f(x)=y and g(y)=x)" (Source: http://wordnet.princeton.edu/perl/webwn?s=inverse%20function)

2. The inverse function is inherent in all functions.

f(x) = y means that 'x' is a function of 'y'. Given the inherency of inverse functions, it likewise means that g(y) = x, which means that 'y' is also a function of 'x'.

Attention is drawn to slide 18 which discloses that the **perturbation equation (correlates to perturbation cost function), is N'(q)q' = 0**. It is seen that N'(q) is based on the state equation N(q) = f, additionally, the N'(q) portion is also based on the adjoint equation N'(q)*r = g, and the adjoint identity (<r, N'(q)q'>.omega2. = <N'(q)*r, q'>.omega2.+b.

The only difference between the claimed invention and the Bewley reference is the **form** of the equation. To exemplify this, taking the function y = 2 + x and rewriting it as y - x = 2 it is seen that both of the functions are identical, but are merely taking a different form. Appellants have merely reworded the equation but the underlying claimed function remains identical to the one disclosed by Bewley. Because all of the functions are interrelated by "N(q)" (and "N'(q)", which is based on "N(q)"), they can be rewritten based on the two mathematical constructs established above, such that the perturbation equation is a function of the based at least in part on the determined adjoint equation, the determined perturbation state equation, and the determined adjoint identity.

Although the Appellants choose to represent the equations in a different form, the underlying claimed function remains the same and is equivalent to the one that is disclosed by Bewley.

In view of the above rationale the Appellants arguments are respectfully traversed.

10.3 Arguments regarding claims 23-27 and 29 are based solely on their dependency of claim 22. The arguments regarding claim 22 have been fully considered and traversed above.

10.4 Examiner Summary:

10.4.1 Appellants have presented an argument that perturbation equation (claimed as "perturbation cost function") is not based on at least in part on the determined adjoint equation, the determined perturbation state equation, and the determined adjoint identity. In response, it was shown that Appellants have merely changed the form of the equation of the claimed invention and the underlying function remains the identical to the one disclosed by Bewley, and is therefor anticipated by Bewley.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

D. Silver 9/10/2007
David Silver, Patent Examiner, Art Unit 2128

Conferees:

EDDIE C. LEE
SUPERVISORY PATENT EXAMINER

Eddie C. Lee, TQAS/Appeals Specialist, TC 2100

KAMINI SHAH
SUPERVISORY PATENT EXAMINER

Kamini Shah, Supervisory Patent Examiner, Art Unit 2128